AMRAD NEWSLETTER

Amateur Radio Research and Development Corporation April 1982

OUR APRIL 5 MEETING will cover the subject of packet radio hardware. Different types of terminal node controller (TNC) boards will be discussed by Dave Borden, K8MMO and Terry Fox, WB4JFI. This meeting will be held at the Patrick Henry Branch Library, 101 Maple Ave East, Vienna, VA. Visitors are welcome.

Also the great attache case fest will take place at this meeting. That's the event where you are allowed to bring **one** attache case of components and other small items for exchange.

SCRATCH APRIL 3&4 AT NEWINGTON, CT because too many vital attendees had to bail out due to other obligations. Another meeting of those interested in East Coast packet networking will be called as soon as we can find a satisfactory date when we can get a quorum.

THE NEXT REGULAR AMRAD MEETING IN VIENNA, VA will be on May 3. Tentative plans are to continue talking about packet radio. Please mark this meeting on your calendar in case the next newsletter is late in getting to you.

FROM THE STACK, the newsletter of the Long Island Computer Association, president Al Stone writes:

We often hear the words "State Of The Art" when the speaker is referring to some particular aspect of computer/electronics communication/ inforation theory technology. What is frequently overlooked is that these States (statuses, actually), are our bailiwick as hobbyists. Ham radio enthusiasts have shown us the way. There are no forbidden realms as far as the clever experimenter is concerned. Our devices do not have to be commercially salable (cost-effective) or optimally sized. The only requirements we place on our forays to the fringes of cybernetic science is that our experiments "work" in some way or another.

Please don't think I'm referring to physical devices (hardware). The limitless freedom to create, to try, to experiment correctly should include hobbyist software. There are monetary and temporal restrictions on programmers in an industrial or commercial environment that simply don't apply to us. We can modify, enhance, append, rewrite to our hearts' content - and we can stay with the same project as long as we desire.

What I'm muttering about here is that we computer hobbyists are in a unique set of circumstances that define an environment for creativity and invention that simply doesn't exist in the typical research establishment. Whereas corporate "think tank" operations can occasionally brainstorm worthwhile technological advances by the "brute force" application of more people and more money, it is equally likely that some independent tinkerer in an attic, den or basement computer room will produce the next universally acceptable advance in the "State Of The Art."

THE TRENTON COMPUTER FESTIVAL on April 17-18 will be the occasion of some type of packet gettogether. Terry Fox, WB4JFI, Steve Robinson, W2FPY, and Paul Rinaldo, W4RI will speak in the forums on packet radio. There will be some time for informal gatherings, probably walking through the flea market. See the TCF-82 notice inside this issue.

THE DAYTON HAMVENTION on April 23-25 will be the next big event. Doug Lockhart, VE7APU and Paul Rinaldo, W4RI will speak at the packet forum at 3:30 on Saturday. There should be representatives from all packet groups in the U.S. and Canada present. Try to make this session.

THE VIRGINIA/CAROLINAS COMPUTER SHOW and Office Equipment Exposition will also be held on April 23-25 at the Virginia Beach Convention Center Pavilion. If you would like more details, call 202-261-1047 or 301-263-8044.

THE FOUNDATION FOR AMATEUR RADIO, Inc., a non-profit organization with headquarters in Washington, DC, plans to award nine scholarships for the academic year 1982-1983. The Foundation, composed to fifty local area Amateur Radio clubs, fully funds two of these scholarships from the proceeds of the Gaithersburg, MD Hamfest. It administers, without cost to the donors, two scholarships for the Quarter Century Wireless Association and one each for the Richard G. Chichester Memorial, the Radio Club of America, the Young Ladies' Radio League, the Edmund B. Redington Memorial and the Amateur Radio News Service. The last-named award is new this year.

Radio Amateurs holding at least an FCC General Class license or equivalent may compete for one or more of these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled or have been accepted for enrollment in an accredited university, college or technical school. The scholarship awards range from $300 to $900, with preference given in some of them to residents of specific geographical areas or the pursuit of certain study programs.

Additional information and an application form can be requested by a letter or QSL/postcard, postmarked prior to May 31, 1982 from:

Hugh A. Turnbull, W3ABC
6903 Rhode Island Avenue
College Park, MD 20740

The Foundation is devoted exclusively to promoting the interests of Amateur Radio and to the scientific, literary and educational pursuits that advance the purposes of the Amateur Radio Service.

AN ON-THE-AIR TECHNICAL SEMINAR is held every Sunday night between 9 and 10 P.M. EST by John Hirley, WB5IIR on 7235 kHz. The talk lasts about 20 minutes; the remaining time is for Q&A. Thanks Radioactivities, the newsletter of the Argonne Amateur Radio Club.

ULYSSES S. ASCII - THE INVENTOR

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According to most commentators, Ulysses Sandor Ascii was born in Rahway, New Jersey on February 2, 1903. His date of birth remains uncertain due to the unfortunate fact that two commentators, Hilda B. Ascii and Bruno Lollomalopalado are now deceased.

Miss Ascii continually claimed that she was the eminent Dr. Ascii's daughter, but no evidence has surfaced to legitimize her claim. Prof. Lollomalopaldo is remembered by some as the foremost historian of Hawaiian culture in New Jersey.

Ulysses' parents were by all accounts immigrants from the Breaker on Yllivvin in Walse. With all their earthly belongings and four ham sandwiches, they boarded the ill-fated steamer H.M.S. Bempley some time in 1889 and travelled steerage to the Port of New York. Legend has it that an immigration official recorded the family name as "Ascii" as a truncated derivation of the actual name, recorded in the register of St. Fidgeta's Church, Breaker on Yllivvin as "Askew." The father is recorded in the same place as Pellew D., named his son for Ulysses S. Grant and is believed to have maintained that Grant was President of the U.S. for most of his life. The senior Ascii deified Grant, and his picture is said to have hung next to that of the Tsar while the family still lived in Walse.

Pellew D. Ascii settled his young family in Rahway, attracted by its Hawaiian culture and Old World manners. Sundry newspaper files report that he died minutes after Ulysses' birth. The cause of death was given as shock.

Ulysses reputedly left home at the age of eleven to study communications theory with Prof. Flanders Watthour, K.C., the leading psychic medium in the Rahway-Elizabeth community. Together, they outfitted an expedition and established the Secret Pellew Colony in Union City, NJ in 1916. Some of their earliest communications experiments are still positively recalled in various taverns in Union City and Weehanken. The colony was forcibly disbanded by paramilitary vigilantes in 1920. Brought up on charges involving the allegedly obscene rites of the colony, Ulysses was returned to Rahway where he completed his education as a guest of the state. Prof. Flanders Watthour (q.v.) disappeared with most of the papers and written records of the colony.

A few fragments were recovered at high tide in Bayonne, NJ, quite by accident when an ESSO oil barge struck what appeared to be a cement buttress. Upon closer examination, it was found to be an earlier attempt to construct Grant's Tomb according to plans drawn by a relative of Cornelius Vanderbilt.

Beneath the tomb was a leaden box which was covered with mystical symbols and signed by Emil Baudot. The box contained detailed drawings which, upon examination by the entire faculty of Columbia University in the Spring of 1951, proved to be the incoherent crayon scribblings of a man named (fnu?) Murray (lnu?).

U. S. Ascii studied with Dr. Bruno Lollomalopaldo and the Rev. Alexander Babafray, fellows of Rahway state as well. Letters ascribed to Ascii's maternal uncle Pincas M. Basarab of Shamokin, PA tell little of his studies. Envelopes show that Ascii gave his return address as Penn. State instead of State Pen., probably to save the family's name.

After graduation from "Penn. State," Ascii's career demonstrated considerable misdirection. His only known novel, set in Secaucus, NJ and titled, "Not a Pig Left Anywhere," was put into type by inmates at his alma mater and sold only three copies, all to his uncle Pincus.

Details of his life after this point became sketchy. We are able to surmise only that after the experience as a failed author, Ascii moved to Baltimore where he took to the sauce. He was known for his preference in imported wines (Bali-hi mostly, Ripple when he could get it).

Ascii became increasingly despondent during this period and took to long stays around the Baltimore wharves where he amused himself by gambling away the little money that was his. To pass the time of day, he spent odd hours in Engine Company No. 5 devising Fire Codes. His one-alarm, two-alarm, etc. system caught on and was eventually recognized by the National Embers Society.

In 1933, he was one of the players in an historic game of liar's poker at Windy Paradise Cafe on Water Street involving two fellows named Ebb Cedick and Rene Wei Paquet, who claimed that he had a "code in the node." Using his own method of beating the system (the Chinese remainder theorem) Ulysses won a used Philco radio with only one knob missing. In reconstructing the damaged apparatus, he stumbled onto vital principles of electronics and mathematics. His career took a turn for the worse when a patent based on these ideas was turned down. Later students of Ascii discovered that the devices were the 1001 and 2002 processors, something that Intel wishes could be left out of history books.

He also invented a new optional seven or eight hole (or no-hole) code with unique assignments for everything he found on a discarded typewriter which was missing the fraction key. On the (free) advice of former patent attorney, he filed a trademark application, which was thrown out by the patent office as a frivolous application without merit. The same code was later submitted as someone else's work and eventually adopted by the ANSI X3 committee. Ulysses finally achieved recognition in 1968 when the X3.4 Task Group voted to name their code "ASCII," but not without many grueling night sessions to expand the 'acronym' to American Standard Code for Information Interchange. Ascii finally achieved parity by having his name on his original invention.

Back to the early days in Baltimore. Falling again into despondency, he threw his lot in with the mystical, migrant, bandit gypsy, Tungar Gesohnetten. As a member of his band, he lived in the Jersey Pine Barrens, living off the land and robbing travelers until routed by an expedition of state police led by Lt. Ungar Throughput.

Convicted and sentenced again to Rahway, he became a tenured professor and is known to have taught classes in Meat Science, Greek Athletics and Electronics. Some accounts have it that he married a cafeteria employee, Kay Nada, But no proof of this bond has thus far surfaced. Ulysses Ascii collapsed and died at Rahway on November 4, 1969. Medical examiners recorded that he choked on a prune pit but that foul play was suspected.

His remains were interred in the Hudson River, down wind of Bayonne Harbor by citizens' petition. He lies today near the same mystic monument to General Grant, his namesake. For further reference, consult "Sternwallow's Annals IX."

PROTOCOL

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Repeater Operations

The AMRAD Digital Packet Repeater, operating on a frequency of 147.585 MHz, is louder than ever this month. The power has been increased to 50 watts. The QTH of Sandy, WB5MMB in Vienna, Virginia is proving to be a good location despite the lack of height. In the past I was able to only print the i-d packet during certain parts of the day, but since the power has been raised, I print it much better. More users are desired to work on the software, experimenting with the thruput. So, get building those TNC boards and 202 modems.

Hf Packeteers

This month brings a letter from Ed Kalin, K1RT who has been experimenting with hf packets. Here are some excerpts from the letter:

Early in January, I wrote Hank Magnuski to express my interest in locating a partner on the West Coast who could participate in some experimental hf packet work. I received a reply from Howard Nurse, W6LLO, who shares office space with Hank. Howard was all set to run hf skeds, and after I attempted some modifications to my ST-6 demodulator (as yet unsuccessful) to provide a carrier-detect signal, and the addition of a transmit/receive relay to the TNC (also unsuccessful so far!), I tried to work W6LLO on 20 meters. Howard has a poor antenna on 20 (a dipole that is only a few feet above the roof) and at the moment my only antenna from this location is a 40-meter sloping dipole (sloping towards Europe). Due to the poor antennas on both ends, and the band conditions at the time on 20, we were just barely able to copy each other's cw signals. I went out of town for a week, and when I returned, I made another sked with Howard and started looking for a station with better hf capabilities. Dave Sumner volunteered the use of his station, and with his superb setup it would have been an ideal choice, but unfortunately he was going to be out of town, so I found an alternate station in West Hartford, WA1GDX, with a Collins KWM-380, an Alpha 76 amplifier, and a 60-foot tower with a decent 20-meter antenna. Last Sunday, (February 8) I brought my computer, the W1AW TNC, and my ST-6 over to the WA1GDX station, and after a short bout with Murphy's Law I was set up to send and receive packets via hf. After...some last minute tricks with the W6LLO soldering iron, we were successful. We succeeded in exchanging call signs, and then tried to 'connect' one board with the other. Signal strengths were poor at the time, and it required numerous repetitions and short packets to get information transferred successfully. For example, I was able to successfully send 'K1RT' and 'W6LLO' as individual packets, but Howard did not receive packets containing longer texts...The nice thing about packet radio is that even if it takes a lot of retransmissions to get a message through, the message that does come through is clean and correct. We were using 170-Hz shift, and a speed of 75 bps for the test...Neither my TNC nor the W6LLO TNC were being operated entirely automatically. I had to manually switch the carrier detect line by moving a clip lead from +12 to -12 volts to go from recieve to transmit, and I also performed the KWM-380 T/R switching manually. W6LLO apparently had to do the same with the carrier-detect line...Clearly there is much more work to be done before it becomes routine...

AMRAD congratulates Ed and Howard and a large bravo zulu for the clip lead switch. It is clearly in the AMRAD tradition to switch from transmit to recieve (and actually any other switch function is also approved) using clip lead(s). They should be colored as to function, so as not to confuse the carrier detect clip with the request-to-send clip.

Operating Primer

Some people have expressed concern over the TNC documentation. Some think it is not clear how to use their TNC boards after construction. A short review is in order. A complete new set of instructions will be composed and smoothed by our technical editor, Paul until readable. Here is a short course to get started:

CONNECTION: This is the science of connecting your TNC board with your friend's TNC board to the exclusion of all other packeteers on the channel. You will no longer be in monitor mode, thus the repeater i-d will no longer print on your screen. Using current software, you do not have to use the repeater, if you can hear your friend well on some fm frequency. Connect with your friend by typing his callsign followed by Control-P and a C. The Control-P is the "here comes a command TNC" flag. The C is the command (to connect). The board will then work with the modem and transciever to connect up with your friend. It will try 18 times and quit if not successful. If it succeeds, you will see CCCCCC on your screen.

REPEAT MODE: This is setting your address so the AMRAD repeater will repeat your packets. Use Control-P and R. If you later decide to go direct to your friend, you can go direct, unrepeated by typing Control-P NR.

MONITOR MODE: This is what you get by just resetting your TNC board and typing a numeral 3 to set the cw speed. You can monitor all packets on the channel. If someone is using the repeater, you see two of everything. If you're connected to your friend, you only see one packet, either from him if connected direct or the one from the repeater if connected thru the machine. You see all repeater i-d packets (one every eight minutes) that you hear well in monitor mode.

AUTO LINE FEED: If you want packets sent after every carriage return (most convenient), then type Control-P L. This causes an automatic line feed (firing off packet) after every carriage return.

It should be pointed out for the beginner to computer keyboards that a Control-P means to hold the control key down (far left on most keyboards) and at the same time type a P with your other hand. Control is just like shift, except it generates a different ASCII code. Control-P L thus means:

First hold down the control key with your left hand and at the same time hit the P with your right hand. Then type a single P and the TNC will respond by adding a line feed after every carriage return.

(continued on next page)

Status Report - ARQ System Tests

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As this is being written (March 20), the version 3.0 ARQ software as is being distributed appears to be fully functional, including large file transfers. WOPHD and I have been holding weekly two-hour skeds "exercising" the system, and things are working just fine. We have also learned a few more things about running this system on the air.

We have been running large file transfers (4k) with the decoder in the two-error-correcting mode (DM 02). In this mode there is a small, but non-zero, probability that a garbled block will be accepted by the decoder as a good block. On one day, after passing about 6k of data (850 blocks) we did encounter one undetected bad block which had slipped past the decoder. This was not too surprising, but it did point out that one does need to be careful with data file transfers when operating the decoder in the error-correcting modes (as opposed to error-detecting only).

When the decoder is allowed to attempt to correct two errors in a block, the probability of an undetected bad block is much higher than when the decoder is restrained to attempt only one or no corrections.

There are two things that can be done to cope with this fact of life. First, the decoder could be operated with tighter constraints to greatly reduce the probability of an undetected bad block. Of course, this also reduces the percentage of garbled blocks that can be corrected by the decoder, and therefore increases the number of block retransmissions required, reducing throughput. The other possibility is to just send the file in DM 02, and then use a short checksum program (already incorporated in the software) to run a checksum on the received file to verify its accuracy. Then if an error is detected in the file, the complete file will need to be retransmitted. This technique would also suggest that it would be a good idea to split large files into smaller sub files (perhaps 1k each) so that if a bad block slipped through, only a portion of the overall file would need to be repeated.

As of this writing we are still experimenting with these different strategies on 20 meters to see which is the recommended approach. I suspect that we will fine it is best to operate the decoder in the one-error-correcting or error-detecting-only modes for computer program file transfers -- which would permit sending very large files with only a small possibility of needing to retransmit them.

We have also experienced several occasions where multipath propagation seemed to be disrupting the data signals even though the 'scope displays looked pretty good at each end. Under these conditions we were able to obtain a great improvement in block error rates by going to a slower data rate. This has taught us the importance of recognizing these intersymbol interference conditions and being prepared to drop back to a slower data rate at those times.

For the past two months we have been having reliable weekly two-hour QSOs on 20 meters (at 75- and 110-bps data rates) regardless of selective fading, temporary fading, and noise. This has been a real experience, because the software was providing a very nice communications channel.

Especially when we run the system at only 75 bps, it is very easy for the sending operators to get ahead of the transmit buffer. It is not even very hard to get ahead of it by 15 minutes or so. Under these circumstances we have discovered another advantage of the system. You can eat your lunch in the middle of a QSO without disrupting the flow of information in either direction.

Typically, after typing several paragraphs of comments into the system for transmission, one can switch the I/O over to the RCV mode and eat lunch while sitting back to read what is being received over the link from the other end. The system status display always shows the operator how close the system is to catching up with the data that he has already entered for sending... so he knows about how much longer he has before the system will go into an idling state after sending it all. It is rather entertaining to watch the two computers alternately transmitting and receiving until the files are completely transferred, while the operators sit back and read the incoming data.

Several new stations have obtained the ARQ software, and Wally and I look forward to QSOs with them as soon as they get their computers and radios interfaced. We are planning to conduct some tests comparing transfer times for 4-k files under different combinations of channel data rate and decoder mode. These should make for some interesting conclusions on the optimal strategies for sending data under bad conditions. Another statistic we would like to compile is the expected time to transfer a typical 256-byte packet including overhead bits over an hf link.

PROTOCOL (continued from previous page)

For your final exam, connect with yourself thru the repeater. This is actually a fine test of your TNC board. Type a Control-P R to set your address into the request to be repeated range. Then type your own callsign followed by Control-P C. You will hear your TNC connect with itself. Try to identify each packet you hear. There is a bug in the code (actually a delay is too long) that causes six packets for every one initiated by the user TNC. There should only be four:

PACKET from the user to the repeater

PACKET repeated by the repeater

ACK from the user

ACK repeated by the repeater

Currently the delay to expect an ACK is too long so the TNC demands a response too soon thusly:

PACKET from the user to the repeater

PACKET repeated by the repeater

ACK from the user

DEMAND RESPONSE PACKET from the user

ACK repeated by the repeater (user actually gets this one)

DEMAND RESPONSE PACKET repeated by repeater

This will all be fixed eventually. 73 for now and I will be listening on 147.585 for new packeteers testing their TNC boards.

Tucson Amateur Packet Radio Activities

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The month of February marked our venture into viability, with completion of the design stages of our first terminal node controller (TNC). We are waiting for a few parts to arrive during the week of March 9th and a dozen prototype (alpha) boards to arrive from a local PC manufacturing facility at the same time. Lyle, WA7GXD gives the current timetable for testing, in his hardware report below, along with a closer look at some of the self-testing features of the TNC. Chuck, NOADI also gives a very brief software/protocol report, which will be greatly expanded next month if we find that the programs really work!

President's Report

Our first general meeting was held in mid February, with a strong showing from Tucson and Phoenix. Since then, we have had several more individuals and clubs join our membership list, both locally and remotely. Especially promising is the expanding number of sites interested in testing our beta board, including hams in Los Angeles, San Francisco, New York, various parts of New Jersey, Maryland (AMSAT), Washington, DC, Little Rock, St. Louis, and locally in Tucson, Phoenix and Green Valley.

In addition to our current alpha test efforts, we are working on two projects with AMSAT and a joint terrestrial-linking effort with the NJ groups. Some of our hams in Tucson and Phoenix with strong microwave background are looking into the design of a low-cost, professional-quality L-band transmitter strip for uplinking to the AMSAT Phase III-B satellite, due for launching early this summer. We're also looking into the possibility of future projects involving active packet repeating equipment on board AMSAT satellites. Our joint discussions have been very promising to date. The NJ collaboration is centered around the AMRAD 220-MHz, 56 kb/s terrestrial packet linking system, which as been under various stages of discussion since last year. Lyle has been quite busy analyzing the functionality presented by various combinations of microprocessors and support ships, and some initial configurations are being discussed by both groups.

TAPR Hardware Report WA7GXD>

Progress on the TAPR TNC is both real and rapid. As this is being written, the PC artwork for alpha test is being reduced to a set of negatives (kudos to KD2S, NOADI and WB7ESQ for their yeoman assistance in the board layout project). Negotiations are underway for commercial assembly of the boards, perhaps in time for alpha test, and parts for alpha test are stacking up, awaiting the PC boards. The adrenalin is certainly flowing here in Arizona!

After alpha test (12 boards) here in Southern Arizona, beta test will commence. We are currently talking to several groups about participation in this exercise. If your area desired to be considered for involvement in this test, please contact TAPR for details. The test will be conducted with standardized forms, formal reporting procedures, and so forth. The goal is to ensure that the TAPR TNC is reliable, friendly, well-documented, properly packaged for shipment, and that the myriad other necessary details that need attention are addressed. Beta production will be limited, so please let us know of your desire to participate today!

After successful conclusion of beta test, the TAPR TNC will be made available to the Amateur Radio community at large. The initial, general form will be as a loaded, tested, calibrated PC board. The cabinet package will follow shortly thereafter.

The currently projected time frame for alpha test is mid-March through mid-April. Beta test should begin by late April and will likely run through May. Sometime in June, the general release will occur. While June may seem far away, TAPR feels it best to have a complete, documented, throughly tested system that anyone can use, and this testing phase is a necessary part of 'product development.' Packet radio is going to change the Amateur Radio landscape in the 80s to a similar degree that fm changed it in the 70s. Enough philosphizing.

As promised last month, here is a look at the self-test, calibration and diagnostic features of the TAPR TNC.

Self test, involked at power-on reset, exercises all on-board LSI and memory. As each peripheral IC is initialized, a read of its registers is performed to confirm initialization. If an error is detected, N-retries are attempted before the error is logged. Initialization then continues.

ROM-based memory is check-summed, and the checksum is compared to a check-sum value located in the (EP)ROM. RAM-based memory is testing on a bit-wise basis, and the limits of RAM determined by the page boundary of the first-detected bit failure.

Upon completion of this exercise, the system attempts to report its findings to the user. If there are errors detected (failure to init, bad check sum, insufficient RAM) an attempt will be made to communicate the specific findings to the user port(s). Since the possibility exists of failure in the user port(s) LSI, the CPU will also attempt to flash some of the LED indicators to alert the operator that something is wrong.

Calibration routines exist on board for setting up the 1200-baud modem. Three frequencies need to be set: 1200 Hz and 2200 Hz on the XR2206 fsk modiulator IC, and 1800 Hz on the XR211 fsk demodulator IC. This is accomplished by setting up a few jumpers (push-on shorting clips, supplied) and invoking the calibration routine from the user console. An on-board 16-bit event counter is used to measure the period of the signal on its input, and the resultant period is compared to a constant representing the desired frequency. Two LEDs are provided to indicate 'frequency high' and 'frequency low.' When both LEDs are on or flashing, the frequency setting is correct to +5 Hz. Frequencies are set with 15-turn trimpots for ease of adjustment. A sharper circuit is provided to allow measuring the period of the rather unusual waveform produced by the XR2211. →

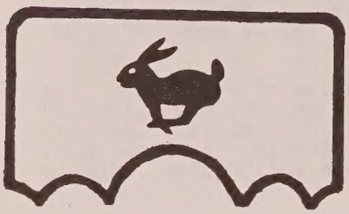
Next month: a look at the transceiver interface interface hardware. Please contact TAPR with any suggestions for improvements of changes, or questions regarding the TNC design. We want this TNC to be your TNC. 73 until next month, Lyle Johnson, WA7GXD, TAPR Hardware Chairman.

Protocol NOADI>

With alpha test rapidly approaching, a subset of the TAPR local area network protocol is currently being implemented. This subset will support an isolated local area network (no linking to other networks yet). It will not implement the manual or automatic switching of the Network Control Station provided for in the protocol. Also not being implemented for alpha test is the ability for a station to exist within the domains of two Network Control Stations operating on the same frequency.

The 'special features' of the protocol not being implemented for alpha test will be added as time permits. We are anxiously looking forward to the opportunity of seeing the protocol in action (on the air). By this time next month, I hope to be able to report on its sucess. 73s, Chuck Green, NOADI.

Please feel free to call, write or meet us on the air with any questions that you might have. As AMRAD begins its weekly hf net, we will be found there in menacing numbers! Enjoy the digital flow... 73, Den, KD2S.



SPREAD SPECTRUM

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Here, for your information, are the comments that we filed with the FCC on their NOI/NPRM for permitting spread spectrum on vhf ham bands:

Before the
Federal Communications Commission

In the Matter of	)	
	)	
Amendment of Parts 2 and 97	)	
of the Commission's Rules	)	
and Regulations to	)	GEN DOCKET NO. 81-414
authorize spread spectrum	)	
techniques in the Amateur	)	
Radio Service.	)	

COMMENTS

1. The Amateur Radio Research and Development Corporation (AMRAD) supports the FCC's proposal to authorize spread spectrum techniques in the Amateur Radio Service, qualified as follows:

(a) AMRAD recommends extending spread spectrum techniques to General and Technician Class as well as Amateur Extra and Advanced Class licensees. In our experience, there is no reason to believe that the ability to competently handle spread spectrum technology lies mainly in the higher class licensees. Nor, is there reason to believe that the General and Technician Class licensees will act less responsibly on the air with spread spectrum.

(b) AMRAD believes that the door should be left open for codes other than the specific shift-register configurations described in the Appendix to GEN DOCKET NO. 81-414. To restrict codes as proposed in the Docket would tend to limit experimentation. This objection would be removed if there were a provision for FCC registration or approval of additional codes written into the Rules.

2. AMRAD is an experimenters' radio and computer club of over 500 members. We applied for, and were granted on March 6, 1981 a Special Temporary Authority (STA) to conduct specified on-the-air experiments with spread spectrum techniques. Briefly, these experiments were:

Experiment 1 - HF Frequency Hopping (using commercial/military transceivers on the 80, 40 and 20 meter bands)

Experiment 2 - 10-Meter Frequency Hopping (using modified Citizen Band radios)

Experiment 3 - UHF Direct Sequence (using modified amateur television [ATV] transceivers)

Experiment 4 - Earth-Moon-Earth Spread Spectrum (using an 84-foot dish at Cheltenham, MD)

Experiment 5 - 2-meter Frequency Hopping (using modified commercial VHF-FM transceivers)

3. The above experiments are only partially completed. Only Experiment 1 has been concluded. Experiment 2 is in the breadboarding stage. Experiment 5 is ready for on-the-air testing except for a critical part due from a supplier. Little progress has been made on either Experiments 3 or 4. Lack of substantial progress on some experiments was due to the inherent reliance on voluntary experimentation by individual amateurs as well as competition of other activities. The results of AMRAD's spread spectrum experiments will be detailed for the Commission in a separate report on or about March 6, 1982.

4. Because the above experiments include spread spectrum techniques not permitted under the proposed Rules change, AMRAD intends to request a new STA after completion of the report and after consultation with the FCC staff. →

5. There may be a problem specifying the use of the center frequency for station identification as in the proposed Rules change. Designation of certain "home" frequencies may be a more workable system. We have no objection to the center frequency initially with a future option of redefining this requirement based on experience. Further, we suggest that the proposed wording of Section 97.84 (h) include a standard, concise format for identifying. E.g., "DE WD4IWG/SS 100 kHz," would mean that spread spectrum is being transmitted over a 100 kHz bandwidth centered on the indentifying frequency. A brief standardized format would permit development of automatic methods for telegraphic identification.

6. AMRAD is somewhat concerned about spread spectrum's potential for abuse if authorized for the Amateur Radio Service. On balance, however, we feel that the advantages to stimulating state-of-the-art experimentation by permitting spread spectrum outweigh the disadvantages. Nevertheless, it is incumbent on both the Commission and historically self-policing radio amateurs to closely monitor the progress of spread spectrum and take appropriate steps to minimize possible abuse. In order for the Amateur Radio Service to continue to be self policing, amateurs need to develop the means of detecting and identifying spread spectrum transmissions as well as locating sources of interference. Therefore, AMRAD plans to propose a program (in coordination with the FCC Field Operations Bureau and with the American Radio Relay League) to develop a capability for amateurs to self-police their spread spectrum operations.

7. Below are our answers to the specific questions posed in paragraph 15 of GEN DOCKET NO. 81-414:

(a) The emission limitations specified in the proposed amendment to Section 97.73 are considered to be sufficient until such time that experience indicates otherwise.

(b) Although our experience is necessarily limited at this time, it appears that spread spectrum interference to conventional amateur communications will not be a major problem. Of the various conventional amateur modes, radioteletype operation (including packet) appears to be the most vulnerable.

(c) It is not believed necessary for the Commission to have the capability to monitor the content of all amateur communications. However, it is definitely necessary for the Commission to be able to detect spread spectrum signals and identify them. Further, it would be desirable for the Commission to be able to make pre-detection recordings and decode spread spectrum signals when required.

(d) The specific shift registers proposed in the ammendment to Section 97.117 of the Rules are not considered to be an obstacle to self-monitoring by the amateur community.

Respectfully submitted,

February 26, 1982

AMATEUR RADIO RESEARCH AND DEVELOPMENT CORPORATION

1524 Springvale Avenue
McLean, Virginia 22101
703-356-8918

Paul L. Rinaldo, W4RI
President

NEW AMRAD LIFE MEMBER, FRIED HEYN, WA6WZO would like to advise you of existence of the Southern California Amateur Radio Computer Club which he founded in 1979. It currently has about 150 members. In addition to having a monthly meeting and weekly nets, they publish a very informative monthly newsletter. Membership can be obtained by sending $7.00 to the treasurer:

Jim Ford, N6JF
2515 College Dr.
Costa Mesa, CA 92626.

AN ON-THE-AIR TECHNICAL SEMINAR is held every Sunday night between 9 and 10 P.M. EST by John Hirley, WB5IIR on 7235 kHz. The talk lasts about 20 minutes; the remaining time is for Q&A. Thanks Radioactivities, the newsletter of the Argonne Amateur Radio Club.

"TRS-80 MODEL III: PROGRAMMING AND APPLICATIONS by Larry Joel Goldstein, Ph.D is a new book published by Robert J. Brady Company of Bowie, MD. The book offers a complete, from the ground-up introduction to BASIC, Level II BASIC, and Disk BASIC language plus practical applications for a "hands-on" approach.

Contents: A First Look at Computers/Getting Started in BASIC/Morse About BASIC/Easing the Frustrations of Programming/Your Computer as a File Cabinet/An Introduction to Computer Graphics/Word Processing/Computer Games/Programming for Scientists/Computer-Generated Experiments/Some Other Applications of Your Computer/Where to Go From Here.

It is published in 1982, 320 pp, softcover and costs $12.95. For additional information, call toll free 800-638-0220.

THE ELECTRONIC LIBRARY COMPANY now offers its members access to numerous Apple and Radio Shack programs. For an annual membership fee of $25.00, club members may check out hundreds of programs from the library's portfolio for use or preview in the home. A service fee as low as 58 cents per day is charged for the period that the member has the program. For information, dial our computer at 404-447-5254 (300 baud) or write: The Electronic Library Company, Inc., 1101 Noble Forest Drive, P.O. Box 1345, Norcross, GA 30091.

"APPLE INTERFACING" is the name of a useful book by Jonathan Titus, David Larsen and Christopher Titus, published by Howard W. Sams & Co., $10.95, paperback, 206 pp. Chapters cover: 6502 processor, Apple interfacing, I/O device interfacing, flags and decisions, breadboarding with the Apple, interface experiments and bus control signals. A copy was sent to AMRAD compliments of Jon Titus; it will be put to good use.

NATIONAL SEMICONDUCTOR CMOS TECHNOLOGY SEMINARS will take place across the country in April and May, according to the following schedule:

Apr	City	May	City
13	San Diego, CA	3	Baltimore, MD
14	Phoenix, AZ	4	Philadelphia, PA
15	Denver, CO	5	Boston, MA
16	Albuquerque, NM	6	Danbury, CT
19	Belview, WA	7	Poughkeepsie, NY
20	Los Angeles, CA	10	Long Island, NY
21	Orange Country, CA	11	Fairfield, NJ
22	Santa Clara, CA	12	Rochester, NY
26	Dallas, TX	13	Toronto, ON
27	Houston, TX	17	Pittsburgh, PA
28	Atlanta, GA	18	Cleveland, OH
29	St Petersburg, FL	19	Dayton, OH
		20	Indianapolis, IN
		21	Kokomo, IN
		24	Chicago, IL
		25	Milwaukee, WI
		26	Minneapolis, MN

For registration information call the CMOS Seminar Information Center at 408-737-5006. The cost of the seminar is $20.00.

VOLTAGE SPIKE PROTECTOR (61-2790) is now available from Radio Shack stores at $9.95. It absorbs voltage transients associated with power line surges. It plugs into a 3-wire outlet and handles 15A at 125V.

PLEASE CHECK YOUR MAILING LABEL to see if the word "RENEW" is there. The computer is programmed to delete members who are more than three months behind on dues. So, if it's time to renew, it might be helpful to immediately head for the check book and get your renewal in the mail before it gets forgotten.

THE DEAF AND THE TTY

Barry Strassler
Executive Director
Telecommunications for the Deaf, Inc.
814 Thayer Avenue
Silver Spring, Maryland 20910
301-589-3006

TDI Establishes Priorities

The Telecommunications for the Deaf, Inc. (TDI) had its meeting of the board of directors on the weekend of February 26-28, 1982. Emerging from that meeting was a new set of priorities, made necessary due to changing winds in the world of deaf telecommunications.

There are thirteen items on the priority list, but mentioned below are those that should be of interest to AMRAD members as well as fellow electronic/computer hobbyists.

1) to study the ramifications of the AT&T deregulation to see how these affect the deaf community.

2) to study the feasibility of establishing product evaluation standards for existing TDDs on the market.

3) to encourage widespread use of computer telecommunications to enable deaf communities to develope their own electronic mail systems.

4) to revise the "Teletypewriters Made Easy" manual, necessary for repairing and reconditioning of TTY machines (Models 15, 19, 28, 32, Lorenz and Siemens).

5) to encourage independent telephone companies to offer services to the deaf on the same level that AT&T and its Bell affiliates have performed in the past.

6) to encourage continuation of Line 21 and the Teletext captioning on television.

7) to study how cable TV can be of assistance to the deaf.

The priority changes were made necessary since the last two years witnessed sweeping developments, benefitting the deaf (Nationwide Operator Assistance Services, reduction of interstate toll rates, free TDDs in California, and emergency of dual-modem TDDs. The board of directors had to reasses its situation and thusly come forward with new recommendations for TDI to focus on in the year to come.

Because each of these items affect deaf people, TDI wishes to make it known that you should write to the TDI home office giving your comments/feedback on these matters.

The Design of HEX2

Richard Barth, W3HWN
11523 Charlton Drive
Silver Spring, MD 20902
301-681-7372 (voice)
301-593-7033 (HEX)

The Handicapped Educational Exchange (HEX), as some of the more distant readers of the AMRAD Newsletter might not know, is a computer bulletin board set up by AMRAD under a grant from the Department of Education. It has a two-fold purpose: it is to provide a clearinghouse for information on the use of modern technology (e.g., computers) to aid the handicapped; it is also to demonstrate the usefulness of microcomputers in providing a communications facility for the deaf. This facility is provided by virtue of the fact that the HEX, alone among public CBBs, is accessible by callers using a TTY/TDD. (There are and were others, such as the Washington Deafnet, now defunct, and the Boston Deafnet.)

The first HEX was developed in 1980 by Robert Bruninga, WB4APR, and runs on a 6800. The software was required under the terms of the grant to be written in BASIC, in order to provide portability to other machines and thus to simplify duplication of the system. It provides a public bulletin board of the usual variety, with the unusual addition of a database of handicapped-related information and the ability to talk to a TTY. The mandatory use of BASIC as a programming language provided just the sort of limitations on the board that one might expect; it is slow, and memory limited. The need for portability also prohibited the use of some features of the computer's BASIC that might have made it more flexible because these features are not universally available in other BASICs. But all in all, it has done the job it was intended to do, and has done it well.

Shortly after the HEX became operational (in the early part of 1980) Bob Bruninga left on orders for Japan and I assumed operational responsibility for the HEX. With the system came correspondence (computer and paper) with users who had many helpful suggestions for the improvement of the system. Some of these were implemented immediately; others, unfortunately, could not be because of limitations of the hardware and software. The HEX program was occupying the entire available memory of the machine, and the most minor modification to the software required careful checking and compressing of code to ensure the system didn't crash because of memory overflow. It became apparent that the operation of the HEX could be much improved with the installation of some of the other features that had been requested, including speedier message access, nulls, message privacy, simplified location of messages dealing with a particular subject, editing of messages being entered, multiple phone lines to eliminate the busy signals increasingly received by callers, and last but not least, a simplified command set for the user. (How to implement a vastly increased number of features with a reduced number of commands posed an interesting challenge -- read on to see how it was done.)

A follow-on grant from Education funded the purchase of a new computer, a 6809 with 56k of memory and a 30-megabyte hard disk, with which to expand the capabilities of the HEX. This machine has a CPU with a vastly improved instruction set, which greatly simplifies the writing of re-entrant and position-independent code. This, in turn, makes it possible to write a bulletin board program in which the code can be shared by multiple callers, each using it during his respective time slice. The new machine also has a disk controller card which does disk accesses independently of the main CPU, greatly speeding up the operation of the system. For the reasons already discussed, it was decided to program the 6809 in assembly language.

As noted previously, the users of HEX had provided a number of suggested improvements to the system. Those that had had to be shelved in the previous incarnation of HEX, were brought out, dusted off, and created the first draft of the HEX2 wish list. Discussions were held with representatives of the deaf community, including representatives of Telecommunications for the Deaf, Inc. (TDI), the operators of the Boston Deafnet, and the users of HEX and the Washington Deafnet. Many valuable ideas were gathered from all of these. During the last few months, it became clear that the Deafnet was soon to cease operation, its grant expired, and that no replacement system had been planned. The HEX was going to have to take up the slack, at least on a temporary basis, until the deaf community in the DC area could plan and install a replacement. Accordingly, the plans for HEX2 were re-oriented to provide some of the features of Deafnet. Not all of them could be covered; after all, Deafnet operated on a PDP-11/35 minicomputer, a much larger machine than the HEX. Never the less, the basics were available. There follows a discussion of the features finally decided on.

Private, password-protected mail boxes were provided, so that users could send and receive communications that were not only unreadable, but totally invisible to others. This is distinct from the common practice of having message originators and addressees show up on a scan, with the subject and text of a message hidden.

Since the HEX must remain a public board, with anyone able to leave and read messages other than private messages, access to a private mailbox is made via the normal logon procedure. A user logs onto the system in the usual fashion, and then issues the "OPEN" command and designates the name and password of the box he wants to access. Messages can be scanned, read, killed, or written to any other box or to the public bulletin board. The user can then close the mail box and open another if he wishes; this permits users to log on, open and use a personal mail box, and then use any organizational mailboxes they might have access to.

The users of Deafnet had a number of options available to them, including word processing and even Adventure! It appears that many of them were interested primarily in reading and writing messages and found the additional features confusing, so didn't use them. I have gotten the same reaction from supposedly computer-oriented hearing people. If it has more than a half dozen options, it's too damn complicated! So, while about 20 commands are available on the public board, There are only six required to use a private box. You log onto the system as usual, and give the "OPEN" command to access a mailbox. Once a box is open, you can READ, WRITE, SCAN, and KILL messages, then say GOODBYE. Or, you can CLOSE the box and make like a regular user of the public board. Or, you can open another mailbox.

In order to simplify the access to information, two customary and one unusual ways have been provided to find messages bearing on a subject of interest. One can SCAN, and receive a one-line statement of a message's date, originator, and addressee or subject. One can also FIND messages having a specified text string in the subject field header. Nothing much new here. The addition is a keyword-flag sort; each message header contains a two-byte field of 16 flags which are set by the system operator based on the subject(s) treated in the message. The user can then, using the ABOUT command, find messages ABOUT such things as deafness and

hearing impairment, visual impairment, learning disability, computers, items wanted or for sale, and the like. Using a single sort with multiple flags, one can combine the subjects "computers" and "education" to find messages dealing with computer-assisted instruction (CAI). In other words, the sort is performed using a logical AND of the flags selected.

I mentioned previously that the change to assembly language, and the new hard disk and disk controller, speed up access time considerably. In the original HEX, messages were stored in files limited to 100 lines, as were message headers. One header file and one message file were read into memory at a time, and had to be written back out to disk, if changed, before another file could be read in. This meant waiting as long as a minute for all the disk thrashing to complete before a requested message would start to appear on the user's terminal. The new system uses random access files, and will locate, completely buffer, and start sending any message in less than one second. It takes the same length of time to save a message that the user has entered.

Many common bulletin boards (and the Deafnet) are something less than user-friendly. The command structure is not obvious to the new user, and instructions are either missing, unclear, or hard to get out of the machine. HEX2 has a HELP command which lists all the commands available (and which changes, when a mailbox is open, to include only those commands applicable to mailboxes). In addition, the command "H,X" where X is the initial letter of any command, will give explicit instructions on using that command.

The structure of the INFORMATION files is the same as before; they are still sequential files that can be created or modified using the text editor. The procedure by which the program gets these files has been significantly changed, however. When the user enters the "I" command he is immediately sent the contents of the INFO catalog file, telling him what INFO files are available. He may then enter a one- or two-character label for any file, which will be loaded into a buffer and sent to him beginning in less than a second. Files can be added, deleted, renamed, or modified without any changes to the program, since the software will accept any two characters as a file request and send that INFO file, if it exists. If it doesn't, the users is told "No information available" and is asked for another request. This greatly simplifies the task of keeping files current, since it is not necessary to modify or re-assemble the program each time.

Washington's Deafnet had 24 phone lines (and, no doubt, a colossal phone bill). The computer kept statistics, however, that showed that rarely were more than six lines in use at a time, and more often only two or three were busy. Because AMRAD is limited to providing what is necessary, rather than might eventually be useful, it is planned to begin operation with two phone lines and add more if needed. There does not appear to be a practical limit to the number of lines, by which I mean the system should support as many as it will ever need. It is not planned to include a "linking" option (which permits callers to talk to each other, rather than use the bulletin board) because it is considered unnecessary. While this feature is useful on Micronet and its ilk, which provide long-distance connectivity for the price of a local call, this money-saving is not available via HEX. This means that people can just as well call each other direct and leave the computer out of it.

HEX has, for the two years of its operation, had its phone and maintenance expenses paid partially by the government. The HEX grant, like the Deafnet grant, is now ended, so it will be necessary for operating and maintenance expenses to be borne solely by AMRAD. The amount of these expenses is an unknown quantity at this time, since the number of phone lines needed will depend primarily on the amount of use the system gets from mailbox owners. Since mailboxes are limited in the amount of storage they can use, there is no need to provide a disincentive to those who might otherwise clutter up a disk with a lot of old messages. Also, since linking with other users is not permitted, there is no likelihood that callers will tie up phone lines for hours chatting with each other. So, while mailbox users will probably be asked to provide some degree of financial support to the system, to defray the operating expenses, this will most likely be a flat monthly rate with no variation for time or disk storage.

By the time you read this, HEX2 will probably be operational. I hope you will give it a call on (301) 593-7033 and pass along any information you have of use to the handicapped, or let us know if you are interested in setting up a deaf-accessible bulletin board in your area. We'll be happy to work with you.

AMRAD Amateur Radio Research and Development Corporation

Membership Application/Renewal

Mail to: Dr. William P. Pala, WB4NFB
5829 Parakeet Drive
Burke, VA 22015

See reverse for overseas mailing rates.

	Annual	Life
Dues: Regular	$15	$180
2nd in family same adr	8	96
Full-time student	5	-

Please make checks payable to AMRAD.

Name_____
Ham Call_____ Home Phone( ) _____

Address_____
City,
State/Prov_____ ZIP/PC_____

I agree to support the purposes of the Corporation.

Class License_____ ☐ARRL Member

Interests:
☐Packet Radio ☐Spread Spectrum
☐RTTY ☐Deaf TTY

Computer model_____
Microprocessor type_____

*Signature*_____

THE AMATEUR RADIO RESEARCH AND DEVELOPMENT CORPORATION is a technically oriented club of over 500 radio and computer amateurs. It is incorporated in the Commonwealth of Virginia and is recognized by the Internal Revenue Service as a tax-exempt scientific and educational organization.

THE PURPOSES OF THE CLUB are to: develop skills and knowledge in radio and electronic technology; advocate design of experimental equipment and techniques; promote basic and applied research; organize forums and technical symposiums; collect and disseminate technical information; and, provide experimental repeaters.

MEETINGS ARE ON 1st MONDAY of each month at 7:30 p.m. at the Patrick Henry Branch Library, 101 Maple Ave E, Vienna, VA. If the 1st Monday is a holiday, an alternate date will be announced in the *AMRAD Newsletter*. Except for the annual meeting in December, meetings are normally reserved for technical talks - not business.

THE WD4IWG/R REPEATER is an open repeater for data communications (including RTTY), voice and experimental modes. It is located at Tyson's Corner, McLean, VA and has excellent coverage. It features a semi-private autopatch available to licensed members. Frequencies are: 147.81 MHz input, 147.21 MHz output. The head of the technical committee is Jeff Brennan, WB4WLW, 7817 Bristow Dr, Annandale, VA 22003, phone 703-354-8541.

THE AMRAD NEWSLETTER is mailed monthly to members and other clubs on an exchange basis. Technical articles, product announcements, news items, and other copy related to amateur radio and computing are welcom. Honorariums at a rate of $10 per printed page ($20 maximum per author per issue) are paid for original material accepted, Classified ads are free to members. Commercial ad inquiries are invited. The editor reserves the right to reject or edit any portions of the copy. Items should be mailed by the 8th of the preceeding month to Paul L. Rinaldo, W4RI, Editor, 1524 Springvale Ave., McLean, VA 22101, 703-356-8918. Full permission for reprinting or quoting items in the newsletter is granted provided that credit is given to both the author and the newsletter. Mailing to U.S. and possessions is by 3rd Class bulk mail. Canadian/Mexican addresses add $2 for postage. Overseas readers add $8 for air mail or $2.30 for surface.

THE AMRAD MESSAGE SYSTEM is an S-100 Computerized Bulletin Board System on 703-734-1387, system operator Terry Fox, WB4JFI. Terry's home phone number is 703-356-8334. The system accepts 110, 300, 450 and 600 baud ASCII callers using Bell 103-compatible modems.

THE HANDICAPPED EDUCATION EXCHANGE (HEX) is operated by AMRAD for those involved in education and communications for the handicapped. It accepts both 110/300-baud ASCII and deaf TTY callers. on 301-593-7033. The sysop Dick Barth, W3HWN's home phone is 301-681-7372.

AMRAD OFFICERS for 1982 are:

Gerald Adkins, N4GA	Treasurer
Richard Barth, W3HWN	Alternate HEX Sysop
David W. Borden, K8MMO	Alternate
Jeffrey Brennan, WB4WLW	Director Repeater Trustee
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Terry Fox, WB4JFI	Director Vice Pres CBBS Sysop
William Pala, Jr., WB4NFB	Director Secretary
Tedd Riggs, KC4YN	Librarian
Paul L. Rinaldo, W4RI	Director President Editor
Elton A. Sanders, WB5MMB	Director

THE AMRAD LIBRARY is operated by Tedd Riggs, KC4YN, 8402 Berea Ct, Vienna, VA 22180, phone 703-573-5067. Donations of technical books, magazines, manuals and catalogs are tax-deductible.

AMRAD IS AFFILIATED with the American Radio Relay League (ARRL), the Foundation for Amateur Radio (FAR), the Northern Virginia Radio Council (NOVARC), and The Mid Atlantic Repeater Council (T-MARC).

SPECIAL INTEREST GROUPS are formed as needed. Currently we have SIGs on Deaf Telecommunications, Spread Spectrum and Packet Radio. If you are interested in joining or forming a SIG, please contact Bill Pala, WB4NFB, 5829 Parakeet Dr, Burke, VA 22015, 703-323-8345.

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